NOTICE!

ALL DRAWINGS
ARE LOCATED
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Remedial Investigation Report for High Priority Sites

(881 Hillside Area)

Volume II

U.S. DEPARTMENT OF ENERGY

Rocky Flats Plant Golden, Colorado

1 MARCH 1988

REVIEWED FOR CLASSIFICATION/UCAL

By Control Interior Control

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B.R. Lewif @ 6-19-10
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ADMIN RECORD

Section 4.0

4.0 WASTE SOURCES CHARACTERIZATION

This section presents data from investigations of the high priority sites at Rocky Flats Plant. These sites are all located within the 881 Hillside Area. Presented are revised locations of the high priority sites and concentrations of hazardous substances and radionuclides identified above background levels.

4.1 INTRODUCTION

This investigation focused on source characterization of past waste disposal sites as preliminarily identified and located for the RCRA Part B Permit Application (Rockwell International, 1986a) and the CEARP Phase I report (DOE, 1986b). These Solid Waste Management Unit (SWMU) locations are herein revised and/or verified based on the additional data collected during this investigation (Plate 4-1).

Characterization of SWMUs is based on information regarding historical waste management practices and on data collected during 1986 and 1987 field investigations. Soil samples and a review of historical aerial photographs are the major sources of data, but soil gas samples, ground-water, and surface water samples are also considered in characterizing the SWMUs. Soil samples collected in 1987 were analyzed for the parameters listed in Table 4-1, and Table 4-2 summarizes soil sampling results included in this report. Borehole and monitor well locations are shown on Plate 4-1 with revised SWMU locations. Appendix D presents the rationale for the drilling program and the borehole sampling procedures. Plate 4-2 shows soil gas sample locations, and Plates 4-3, 4-4, 4-5, 4-6, and 4-7 present soil gas data for

TABLE 4-1

SOURCE SAMPLING PARAMETERS, SOIL AND WASTE SAMPLES

Metals

Hazardous Substance List - Metals Beryllium Chromium (hexavalent) Lithium Strontium

Organics

Hazardous Substances List (Volatiles and Semi-Volatiles) Oil and Grease

Radionuclides

Gross Alpha
Gross Beta
Uranium 233, 234, and 238
Americium 241
Plutonium 239, 240
Strontium 90
Cesium 137
Tritium

Other

Characteristics (i.e., ignitability, corrosivity, reactivity) pH

Note: Analytical methods are presented in the IGMP Work Plan for Rocky Flats Plant (DOE), 1986a.

Table 4-2
BORBHOLE SAMPLE INFORMATION
881 HILLSIDE BORBHOLES

Name		35	SAMPLE INFORMATION	8				LABORATORY	LABORATORY BATCH NUMBERS		
6/17/87 1.2.0 - 1.1.0	BOREHOLE Number	KUMBER	DATE	DEPTH INCREMENT (ft.)	SAMPLE	VOLATILE	SENT-VOLATILE ORGANICS	PESTICIDES AND PC8'S	METALS	INDRGANICS	RADIOCHENISTRY
BANGESTIMEN 1,50 × 1,129 81,134 1,104-17-001 1,122-41-06 1,1	283	BH018701MT	06/04/87	0.20 - 1.40	5	8706-022-0010	8706-022-0020	8706-022-0020	8706-022-0020	8706-022-002	1000-000-001
BANCESTIONE CANADATE CANADA		RH018704MS	06/04/87	4.50 - 5.70	CT.0	8706-022-0030	8706-022-0040	8706-022-0040	8706-022-0040	8706-022-004	1000-000-002
800231147 65(27)87 1.0.0 - 11.80 CG 3122-471-005 3122-471-005 3122-471-005 3122-471-005 3122-471-005 800231147 65(27)87 14.50 - 24.50 CG 3122-471-006 3122-471-005 3122-471-00	2 6	BH018710MS	06/04/87	10.00 - 11.50	₩.	8706-022-0050	8706-022-0060	8706-022-0060	8706-022-0060	8706-022-006	1000-000-003
880231100 65/21/87 1.50 - 1.8.0 1.50 - 1.8.0 1.50 - 1.9.0	100	CLOOCOCOLO	T0/17/130	90.0	3	1122-471-005	3122-471-005	3122-471-005	3122-471-005	3122-471-005	1000-000-004
800231142 65/21/87 14.30 - 14.30 17.40 18.05-551-010 810	9 5	7100/07040	10/17/00	11.00	3 E	1172-471-001	1122-471-001	3122-471-001	3122-471-001	3122-471-001	1000-000-005
BHC871147 St. 17, 18, 18, 10 BK 3122-471-06 3122	è 5	8HUZB/1214	10/17/00	11.50 - 14.30	3 8	010-10-100	8705-057-0110	8705-057-0120	8705-057-0120	8705-057-012	1000-000-000
BINGSTOON C6/19/67 Car	2 5	64026/1420 64026/14CT	10/17/c0 Fa/17/30	05.02 - 00.01	3 5	8705-057-0130	8705-057-0130	8705-057-0140	8705-057-0140	8705-057-014	No Sample
BHOSENOON C6/19/87 2.00 - 4.00 C3 BTO-615-004 BTO-615-006 BTO-615-005 BTO-615-004 BHOSENOON C6/19/87 2.00 - 4.00 C3 BTO-615-004 BTO-615-005	281	BH0287188R	05/27/87	17.90 - 18.60	5 25	3122-471-006	3122-471-006	3122-471-006	3122-471-006	3122-471-006	1000-000-001
BHOSSTITION 65/19/87 2.56 - 4.00 CT BTOS-651-004 BTOS-651-005 BTOS-	101	OUNTOTONO	05/19/87	75 8 - 60 0	8	No Samole	8705-051-006	8705-051-006	8705-051-008	8705-051-004	1000-000-008
BHOSSITION 65/1987 2.45 - 3.50 HT B105-651-005 B105-65	9 5	6407670704 6407670704	78/11/50	2.00 - 4.00	8 8	8705-051-004	No Sample	No Sample	No Sample	No Sample	No Sample
BHOGSTOCK CG/19/8 7.115 - 18.75 CT BTOG-OS1-ON	ý ď	BH078707WT	19/11/50	2.65 - 3.90	3 5	8705-051-005	8705-051-005	8705-051-005	8705-051-007	8705-051-003	1000-000-000
BHOSSTOCK GS/19/87 11.75 - 13.25 BR 8105-051-004 8105-051-004 8105-051-004 8105-051-004 8105-051-004 8105-051-004 8105-051-004 8105-051-004 8105-051-004 8105-051-004 8105-051-004 8105-051-004 8105-051-004 8105-051-004 8105-051-004 8105-051-004 8105-051-004 8105-051-012 8105-051-013 8105-	à S	RH038709CT	05/19/87	7.15 - 8.75	: 5	8705-051-007	8705-051-003	8705-051-003	8705-051-003	8705-051-001	1000-000-010
BHO4871041 06/16/87 10.00 - 10.00 CD 10.00 CD 10.00 CD 10.00 CD CD CD CD CD CD CD	£ 5	8H0387128R	05/19/87	11.75 - 13.25	25	8705-051-008	8705-051-004	8705-051-004	8705-051-005	8705-051-006	1000-000-011
BHO4871947 06/05/87 10.30 - 15.70 CT BTO6-024-0040 8706-024-0040	487	010078A048	06/05/87	1	8	8706-024-0030	8706-024-0060	8706-024-0060	8706-024-0060	8706-024-006	1000-000-012
BHOGSTOCK 66/05/87 15.30 - 15.70 CT 8706-024-0020 8706-024-0020 8706-024-0040 8706-024-0040 8706-024-0040 8706-024-0040 8706-024-0040 8706-024-0020 8706-024-0010 8706-024-011 8706-024-011 8706-024-011 8706-024-011 8706-024-011 8706-024-011 8706-024-011 8706-024-011 8706-024-011 8706-024-011 8706-024-011 8706-024-011 8706-024-011 8706-024-011 8706-024-011 8706-024-011 8706-024-011<	i 6	BHO48710MT	06/05/87	10.30 - 12.80	; ;	8706-024-0040	8706-024-0080	8706-024-0080	8706-024-0080	8706-024-008	1000-000-013
BHOGSTOKET 65/20/87 19.30 - 20.30 BR 8706-024-0020 8706-024-0020 8706-024-0020 8706-024-0020 8706-024-0020 8706-024-0020 8706-051-015	2 6	RH048715CT	06/05/87	15.30 - 15.70	5	8706-024-0020	8706-024-0040	8706-024-0040	8706-024-0040	8706-024-004	1000-000-014
8H05870XC 65/19/87 0.00 - 4.50 CT 8705-051-014 8705-051-012 8705-051-012 8705-051-012 8705-051-013 8705-051-014 8705-051-012 8705-051-014 8705-051-013 8705-051-014 8705-051-011 8705-051-011 8705-051-011 8705-051-011 8705-051-011 8705-051-011 8705-051-012 8705-051-011 8705-051-012 8705-051-011 8705-051-013 8705-051-013 8705-051-013 8705-051-014 8705-051-014 8705-051-014 8705-051-014 8705-051-014 8705-051-014 8705-051-014 8705-051-014 8705-051-014 8705-051-014 8705-051-014 8705-051-014 8705-051-014 8705-051-014 8705-051-014 8	6	BH048719BR	06/05/87	19.30 - 20.30	æ	8706-024-0010	8706-024-0020	8706-024-0020	8706-024-0020	8706-024-002	1000-000-015
BHOSS/05CT 65/19/87 2.00 - 4.50 CT 8705-051-014 8705-051-014 8705-051-014 8705-051-014 8705-051-014 8705-051-014 8705-051-014 8705-051-017 BHOSS/05CT 05/19/87 7.50 - 9.30 8R 8705-051-007 8705-051-001 8705-051-014 8705-051-014 8705-051-014 BHOSS/06R 05/20/87 10.00 - 10.00 CD 8705-051-100 8705-051-007 8705-051-010 8705-051-010 8705-051-011	6	8H05870005	05/19/87	0.00 - 4.50	8	8705-051-014	8705-051-013	8705-051-012	8705-051-015	8705-051-016	910-000-0001
BHOGRINGE 05/19/87 7.50 - 9.30 8R 8105-051-012 8105-051-011 8	6	BH058705CT	05/19/87	2.00 - 4.50	ຣ	8705-051-015	8705-051-014	8705-051-013	8705-051-016	8705-051-017	1000-000-017
BHO6870010 05/20/87 0.00 - 10.00 CD 8705-051-007 8705-051-007 8705-051-007 8705-051-007 8705-051-007 8705-051-007 8705-051-007 8705-051-007 8705-051-007 8705-051-007 8705-051-007 8705-051-011 8705-051-011 8705-051-011 8705-051-011 8705-051-011 8705-051-011 8705-051-011 8705-051-011 8705-051-011 8705-051-011 8705-051-011 8705-051-011 8705-051-011 8705-051-011 8705-051-011 8705-051-012 8705-051-011 8705-051-012 8705-051-012 8705-051-010 8705-051-012 8705-051-010 8705-051-009 8705-051-009 8705-051-012 8705-051-009 <th< td=""><td>287</td><td>BH0587088R</td><td>05/19/87</td><td>7.50 - 9.30</td><td>%</td><td>8705-051-013</td><td>8705-051-012</td><td>8705-051-011</td><td>8705-051-014</td><td>8705-051-015</td><td>1000-000-018</td></th<>	287	BH0587088R	05/19/87	7.50 - 9.30	%	8705-051-013	8705-051-012	8705-051-011	8705-051-014	8705-051-015	1000-000-018
BHOG8726CT 65/20/87 10.00 - 20.00 CD 8705-051-010 8705-051-011 8705-051-011 8705-051-011 8705-051-011 8705-051-011 8705-051-011 8705-051-011 8705-051-011 8705-051-011 8705-051-011 8705-051-011 8705-051-011 8705-051-011 8705-051-012 8705-051-011 8705-051-012 8705-051-011 8705-051-012 8705-051-012 8705-051-012 8705-051-013 8705-051-013 8705-051-013 8705-051-013 8705-051-013 8705-051-013 8705-051-013 8705-051-013 8705-051-013 8705-051-013 8705-051-013 8705-051-013 8705-051-013 8705-051-013 8705-051-013 8705-051-013 8705-051-013 8705-051-004 8705-051-013 8705-051-013 8705-051-013 8705-051-013 8705-051-013 8705-051-004 <t< td=""><td>68</td><td>BH06870010</td><td>05/20/87</td><td>0.00 - 10.00</td><td>8</td><td>8705-051-007</td><td>8705-051-007</td><td>8705-051-007</td><td>8705-051-009</td><td>8705-051-009</td><td>1000-000-019</td></t<>	68	BH06870010	05/20/87	0.00 - 10.00	8	8705-051-007	8705-051-007	8705-051-007	8705-051-009	8705-051-009	1000-000-019
BHOG8726CT 65/20/87 24.10 - 25.50 CT 8705-051-012 8705-051-011 8705-051-010 8705-051-014 8705-051-010 8705-051-014 8705-051-010 8705-051-011 8705-051-010 8705-051-011 8705-051-010 8705-051-011 8705-051-005 <t< td=""><td>68</td><td>BH06871020</td><td>05/20/81</td><td>10.00 - 20.00</td><td>8</td><td>8705-051-010</td><td>8705-051-009</td><td>8705-051-008</td><td>8705-051-011</td><td>8705-051-011</td><td>1000-000-020</td></t<>	68	BH06871020	05/20/81	10.00 - 20.00	8	8705-051-010	8705-051-009	8705-051-008	8705-051-011	8705-051-011	1000-000-020
BHO7870510 65/26/87 5.00 - 10.00 CO 8705-051-011 8705-051-010 8705-051-010 8705-051-010 8705-051-010 8705-051-010 8705-051-010 8705-051-010 8705-051-010 8705-051-010 8705-051-010 8705-051-005 <th< td=""><td>783</td><td>BH068726CT</td><td>05/20/87</td><td>24.10 - 25.50</td><td>៦</td><td>8705-051-012</td><td>8705-051-011</td><td>8705-051-010</td><td>8705-051-013</td><td>8705-051-014</td><td>1000-000-021</td></th<>	783	BH068726CT	05/20/87	24.10 - 25.50	៦	8705-051-012	8705-051-011	8705-051-010	8705-051-013	8705-051-014	1000-000-021
8HO787051 05/26/87 5.00 - 10.00 CO 8705-057-0050 8705-057-0050 8705-057-0060 8705-057-0060 8705-057-0060 8705-057-0060 8705-057-0060 8705-057-0060 8705-057-0070 <t< td=""><td>183</td><td>BH0687308R</td><td>05/20/87</td><td>27.00 - 30.00</td><td>8</td><td>8705-051-011</td><td>8705-051-010</td><td>8705-051-009</td><td>8705-051-012</td><td>8705-051-013</td><td>1000-000-022</td></t<>	183	BH0687308R	05/20/87	27.00 - 30.00	8	8705-051-011	8705-051-010	8705-051-009	8705-051-012	8705-051-013	1000-000-022
BHO7871035 65/26/87 4.30 - 4.80 CT,FS 8705-057-0070	20	BH07870510	05/26/87	5.00 - 10.00	8	8705-057-0050	8705-057-0050	8705-057-0060	8705-057-0060	8705-057-006	No Sample
BHO7871048 65/26/87 7.80 - 9.68 BR 8705-057-0010 8705-057-0010 8705-057-0020 8705-057-0020 8705-057-0020 8705-057-0020 8705-057-0020 8705-057-0020 8705-057-0020 8705-057-0020 8705-057-0030 <t< td=""><td>187</td><td>RH078705CT</td><td>05/26/87</td><td>4.30 - 4.80</td><td>CT.FS</td><td>8705-057-0070</td><td>8705-057-0070</td><td>8705-057-0080</td><td>8705-057-0080</td><td>8705-057-008</td><td>No Sample</td></t<>	187	RH078705CT	05/26/87	4.30 - 4.80	CT.FS	8705-057-0070	8705-057-0070	8705-057-0080	8705-057-0080	8705-057-008	No Sample
BHO78710MS 65/26/87 10.35 - 13.00 CG 8705-057-0990 8705-002-0050 8705-002-0050 8705-002-0050 8705-002-0050 8705-002-0050 8705-002-0050 8705-002-0050	6	RH0787098R	05/26/87	7.80 - 9.68	35	8705-057-0010	8705-057-0010	8705-057-0020	8705-057-0020	8705-057-002	1000-000-023
BH08870007 66/03/98 0.00 - 6.10 CD 8706-014-0030 8706-014-0040 8706-002-0050 8706-002-0050 8706-002-0050 8706-002-0050 8706-002-0050 8706-002-0050 8706-002-0050 8706-002-0050 8706-002-0050 8706-002-0050 8706-002-0050	187	BH07871013	05/26/87	10.35 - 13.00	8	8705-057-0090	8705-057-0090	8705-057-0090	8705-057-0090	8705-057-009	1000-000-024
8H08870077 06/03/98 0.00 - 6.10 CG 8706-014-0030 8706-014-0040 8706-014-0040 8706-014-0040 8706-014-0040 8706-014-0040 8706-014-0080 8706-014-0080 8706-014-0080 8706-014-0080 8706-014-0080 8706-014-0080 8706-014-0080 8706-014-0080 8706-014-0080 8706-014-0016 8706-014-0080 8706-014-0080 8706-014-0080 8706-014-0016 8706-014-0080 8706-014-0016 8706-014-0016 8706-014-0016 8706-014-0016 8706-014-0016 8706-014-0016 8706-014-0016 8706-014-0016 8706-014-0016 8706-014-0016 8706-014-0016 8706-014-0016 8706-014-0014 8706-014-0016 8706-002-0040 8706-002-0040 8706-002-0040	160	BH078710MS	05/26/87	9.68 - 10.35	æ	8705-057-0030	8705-057-0030	8705-057-0040	8705-057-0040	8705-057-004	No Sample
BH08870001 66/03/87 6.10 - 7.00 CT 8706-014-0070 8706-014-0080 8706-014-0080 8706-014-0080 8706-014-0080 8706-014-0080 8706-014-0080 8706-014-0160 8706-014-0160 8706-014-0160 8706-014-0160 8706-014-0160 8706-014-0160 8706-014-0160 8706-014-0160 8706-014-0160 8706-014-0160 8706-002-0060 <t< td=""><td>789</td><td>RH08870007</td><td>06/03/98</td><td>0.00 - 6.10</td><td>8</td><td>8706-014-0030</td><td>8706-014-0040</td><td>8706-014-0040</td><td>8706-014-0040</td><td>8706-014-004</td><td>1000-000-025</td></t<>	789	RH08870007	06/03/98	0.00 - 6.10	8	8706-014-0030	8706-014-0040	8706-014-0040	8706-014-0040	8706-014-004	1000-000-025
BH0987108R 06/03/87 10.20 - 12.10 BR 8706-014-0150 8706-014-0160 8706-014-0160 8706-014-0160 8706-014-0160 8706-014-0160 8706-014-0160 8706-002-0060 8706-002-0060 8706-002-0060 8706-002-0060 8706-002-0060 8706-002-0060 8706-002-0060 8706-002-0060 8706-002-0060 8706-002-0060	· 6	RH088707CT	06/03/87	6.10 - 7.00	5	8706-014-0070	8706-014-0080	8706-014-0080	8706-014-0080	8706-014-008	1000-000-026
8H09870010 05/29/87 0.00 - 10.00 CO 8706-002-0050 8706-002-0050 8706-002-0060 8706-002-0060 8706-002-0060 8706-002-0060 8706-002-0060 8706-002-0040	288	BH0887108R	06/03/87	10.20 - 12.10	25	8706-014-0150	8706-014-0160	8706-014-0160	8706-014-0160	8706-014-0016	1000-000-027
8H098706#T 05/29/87 6.03 - 6.60 NT 8706-002-0030 8706-002-0030 8706-002-0040 8706-002-0040 8706-002-004	5	OLONCANONA	05/29/87	00 00 - 10 00	5	8704-002-0050	8706-002-0050	8706-002-0060	8706-002-0060	8706-002-006	1000-000-028
	28	BH098706#T	05/29/87	6.03 - 6.60	3 듚	8706-002-0030	8706-002-0030	8706-002-0040	8706-002-0040	8706-002-004	1000-000-029
	:										

Sample Type Codes: BR - Bedrock CO - Composite CT - Contact DM - Direct Hit FS - Field Screen MT - Water Table

Table 4-2 (cont.)
BORRHOLE SAMPLE INFORMATION

881 HILLSIDE BOREHOLES

	5							LABORATORY	LABORATORY BATCH NUMBERS		
BOREHOLE			DEPTH.			VOLATILE	SEMI-VOLATILE	PESTICIDES			
A SECTION AND A	MARKE	DATE	INCREMENT (ft)	=	IVE	ORGANICS	ORGANICS	OND PCB'S	MITALS	INDRGANICS	RADIOCHEMISTRY
10987	BH098711CT	05/29/87	10.08 - 1	8	5	3122-471-009	3122-471-009	3122-471-009	3122-471-009	3122-471-009	1000-000-030
8H0987	BH098714BR	05/29/87	14.30 - 14.75	7.73	25	8706-002-0010	8706-002-0020	8706-002-0020	8706-002-0020	8706-002-002	1000-000-031
ZH1087	BH10670010	28/10/90	0.00	8.0	8	8706-005-0050	8706-005-0060	8706-005-0060	8706-005-0060	8706-005-006	1000-000-032
1087	BH10671020	06/01/87	10.00	8.8	8	8706-005-0030	8706-005-0040	8706-005-0040	8706-005-0040	8706-005-004	1000-000-033
BH1087	BH108720CT	06/01/87	18.95 - 2	9.0	C	8706-005-0070	8706-005-0080	8706-005-0080	8706-005-0080	8706-005-008	1000-000-034
8H1087	BH1087238R	06/01/87	23.00 - 25.40	₹.	55	8706-005-0010	8706-005-0020	8706-005-0020	8706-005-0020	8706-005-002	1000-000-035
H1187	BH11870010	06/02/87	0.00	9.0	8	8706-010-0050	8706-010-0060	8706-010-0060	8706-010-0060	8706-010-006	1000-000-036
BH1187	BH118711CT	06/02/87	8.70 - 10.70	9.70	CT,FS	8706-010-0010	8706-010-0020	8706-010-0020	8706-010-0020	8706-010-002	1000-000-037
11187	BH118714MT	06/02/87	13.90 - 1	0.00	MT, 89	8706-010-0030	8706-010-0040	8706-010-0040	8706-010-0040	8706-010-004	1000-000-038
11287	BH128702CT	05/27/87	0.00 - 2	82	8	8705-059-0010	8705-059-0020	8705-059-0020	8705-059-0020	8705-059-002	1000-000-039
BH1287	BH128705BR	05/27/87	5.25 - 6.50	8	8	8705-059-0030	8705-059-0040	8705-059-0040	8705-059-0040	8705-059-004	1000-000-040
11387	BH13870010	05/29/87	0.00	- 10.10	8	8706-004-0010	8706-004-0020	8706-004-0020	8706-004-0020	8706-004-002	1000-000-041
BH1387	84138711CT	05/29/87	10.10 - 11.56	38:	CT.FS	3122-471-004	3122-471-004	3122-471-004	3122-471-004	3122-471-004	1000-000-042
BH1387	BH1387146R	05/29/87	14.56 - 16.20	6.20	35	8706-004-0030	8706-004-0040	8706-004-0040	8706-004-0040	8706-004-004	1000-000-043
BH1487	BH148703H1	05/28/87	2.00 - 2	8	8	3122-471-007	3122-471-007	3122-471-007	3122-471-007	3122-471-007	1000-000-044
8H1487	BH148706CT	05/28/87	5.50 - 6.50	S	ದ	3122-471-003	3122-471-003	3122-471-003	3122-471-003	3122-471-003	1000-000-045
BH1487	BH148708M2	05/28/87	7.75 - 8	8	85 75	3122-471-002	3122-471-002	3122-471-002	3122-471-002	3122-471-002	1000-000-046
BH1487	BH14870988	05/28/87	6 - 05.9	9.00	£	3122-471-008	3122-471-008	3122-471-008	3122-471-008	3122-471-008	1000-000-047
BH1587	BH15870005	18/03/81	0.00 - 5	8	ខ	8706-014-0130	8706-014-0140	8706-014-0140	8706-014-0140	8706-014-0014	1000-000-048
BH1587	BH15870510	06/03/87	0.00 - 0.00	8		8706-014-0170	8706-014-0180	8706-014-0180	8706-014-0180	8706-014-0018	1000-000-049
BH1587	BH1587268R	06/03/87	24.10 - 2.	5.80	35	8706-014-0110	8706-014-0120	8706-014-0120	8706-014-0120	8706-014-0012	1000-000-020
841687	BH16870206	06/02/87	2.00 - 6.	8	8	8706-010-0110	8706-010-0120	8706-010-0120	8706-010-0120	8706-010-0012	1000-000-051
1687	BH168702CT	06/02/87	0.00	86.	cı	8706-010-0090	8706-010-0100	8706-010-0100	8706-010-0100	8706-010-0010	1000-000-052
BH1687	8H1687068R	06/02/87	6.00 - 6.50	ક	8	8706-010-0070	8706-010-0080	8706-010-0080	8706-010-0080	8706-010-008	1000-000-053
BH1787	BH17870005	06/03/87	0.00 - 3.90	8.	8	8706-014-0090	8706-014-0100	8706-014-0100	8706-014-0100	8706-014-0010	1000-000-054
1787	BH178705CT	06/03/87	3.90 - 5.25	22	5	8706-014-0050	8706-014-0060	8706-014-0060	8706-014-0060	8706-014-006	1000-000-055
BH1.787	BH178708BR	06/03/87	8.22 - 8	8.	8 5	8706-014-0010	8706-014-0020	8706-014-0020	8706-014-0020	8706-014-002	1000-000-056
PMS787	BH578704DH	10/01/87	4.00 - 5	9.8	*	8710-025-0050	8710-025-0010	8710-025-0010	8710-025-0010	8710-025-001	1000-000-526
BH5787	H2787080H8	10/01/87	8.00 - 10.00	0.0	*	8710-025-0060	8710-025-0020	8710-025-0020	8710-025-0020	8710-025-002	1000-000-527
BH5787	BH578710UC	10/01/87	10.00 - 1	2.00	용	8710-025-0070	8710-025-0030	8710-025-0030	8710-025-0030	8710-025-003	1000-000-528
BH5787	BH578712CT	10/01/87	12.00 - 1	8	ದ	8710-025-0080	8710-025-0040	8710-025-0040	8710-025-0040	8710-025-004	1000-000-529
BH5787	BH5787148R BH578714BR	10/08/87	14.90 - 16.00	9 8 8 8	25 25	8710-032-0130	8710-032-0010 8710-032-0020	8710-032-0010	8710-032-0010 8710-032-0020	8710-032-001 8710-032-002	1000-000-426
5		in fac fac			i						

Sample Type Codes: BR - Bedrock CO - Composite CI - Contact DN - Direct Hit FS - Field Screen WI - Water Table

Table 4-2 (cont.)
BORBHOLE SAMPLE INFORMATION

881 HILLSIDE BOREHOLES

		5				CHECKALOR	CHROCK CALLE AUTRES		
BOREHOLE NUMBER MUMBER	PATE	DEPTH INCREMENT (ft)	SSEC	VOLATILE	SEMI-VOLATILE ORGANICS	PESTICIDES AND PCB'S	METALS	INORGANICS	RADIOCHEMISTRY
_		18.00 - 20.00	舌	8710-032-0150	8710-032-0030	8710-032-0030	8710-032-0030	8710-032-003	1000-000-428
		20.00 - 22.00	害	8710-032-0160	8710-032-0040	8710-032-0040	8710-032-0040	8710-032-004	1000-000-429
		22.00 - 24.00	×	8710-032-0170	8710-032-0050	8710-032-0050	8710-032-0050	8710-032-005	1000-000-430
		24.00 - 26.00	害	8710-032-0180	8710-032-0060	8710-032-0060	8710-032-0060	8710-032-006	1000-000-431
187 BHS78726DH		26.00 - 28.00	丟	8710-032-0190	8710-032-0070	8710-032-0070	8710-032-0070	8710-032-007	1000-000-432
BH5787 BH5787280H	78/80/01 HX	0.00 - 0.00	₹	8710-032-0200	8710-032-0080	8710-032-0120	8710-032-0080	8710-032-008	1000-000-433
BH5887 BH588700UC		0.00 - 1.70	3	8710-032-0210	8710-032-0090	8710-032-0090	8710-032-0090	8710-032-009	1000-000-434
		2.00 - 3.90	CI	8710-032-0220	8710-032-0100	8710-032-0100	8710-032-0100	8710-032-0010	1000-000-435
BH5887 BH58870488	IR 10/08/87	4.00 - 7.10	88	8710-032-0230	8710-032-0110	8710-032-0110	8710-032-0110	8710-032-0011	1000-000-436
187 BH598704UC		2.00 - 3.50	3	8710-016-0040	8710-016-0010	0100-910-01/8	8710-016-0010	8710-016-001	1000-000-441
		4.00 - 7.00	5	8710-016-0050	8710-016-0020	8710-016-0020	8710-016-0020	8710-016-002	1000-000-442
BH5987 BH598709BR	R 10/05/87	7.00 - 9.80	25	0900-910-0129	8710-016-0030	8710-016-0030	8710-016-0030	8710-016-003	1000-000-443
KDL07018H8 18707D	_	9.50 - 9.00	舌	8710-040-0020	8710-040-0010	8710-040-001	8710-040-0010	8710-040-001	1000-000-530
BH6187 BH618709CT		9.00 - 11.50	5	8710-051-0030	8710-051-004	8710-051-001	8710-051-004	8710-051-002	1000-000-531
	IR 10/13/87	11.50 - 14.00	25	8710-051-0060	8710-051-005	8710-051-002	8710-051-005	8710-051-005	1000-000-532
BH6287 BH62870006		0.00 - 8.00	deCO	8710-073-0070	8710-073-003	8710-072-001	8710-073-001	8710-073-003	1000-000-447
		0.00 - 8.00	2	8710-073-0080	8710-073-004	8710-073-002	8710-073-004	8710-073-004	1000-000-448
		0.00 - 0.00		8710-073-0100	8710-073-009	8710-073-005	8710-073-005	Ho Sample	No Sample
N6287 BN628712		12.50 - 14.00	5	8710-073-0060	8710-073-002	8710-073-003	8710-073-003	8710-073-002	1000-000-446
87 8H6287148R	10/21/87	14.00 - 16.00	86	8710-073-0010	8710-073-001	8710-073-004	8710-073-004	8710-073-001	1000-000-445
		0.00 - 8.00	delico	8710-056-0040	8710-056-003	8710-056-001	8710-056-001	8710-056-002	1000-000-534
		12.00 - 13.70	3	8710-056-0030	8710-056-004	8710-056-002	8710-056-002	8710-056-001	1000-000-533
	C 10/19/87	18.00 - 18.40	3	8710-063-0040	8710-063-003	8710-063-001	8710-063-003	8710-063-001	1000-000-535
16387 BH638722CT		22.00 - 22.50	៦	8710-063-0050	8710-063-004	8710-063-002	8710-063-004	8710-063-002	1000-000-536
397 BH6387248F		24.50 - 26.00	3 5	8710-063-0060	8710-063-005	8710-063-003	8710-063-005	8710-063-003	1000-000-537

tetrachloroethene (PCE), trichloroethene (TCE), carbon tetrachloride (CCl₄), 1,1,1-trichloroethane (1,1,1-TCA),and 1,1-dichloroethene (DCE), respectively. Appendix F contains analytical results of soil, ground-water, and surface water sampling.

Before discussing soil contamination at the SWMUs in the 881 Hillside Area, some general conclusions are presented below which apply to soil contamination in the entire area. This includes discussion of background metal and radionuclide concentrations in soils and laboratory contamination of soil samples analyzed for volatile and semi-volatile organics. Examination of all soil data indicates trace metals are not contaminants on the 881 Hillside, and there is only one sample with apparent plutonium contamination. Volatile organics were detected in many of the samples on the 881 Hillside, but some of these values may represent laboratory artifacts. These general conclusions, including possible laboratory artifacts, are specifically discussed in relation to each SWMU in the following sections.

4.1.1 Metals and Radionuclide Results

Background metal and radionuclide concentrations in soils have been developed based on 1986 sampling and analysis done in the west buffer zone (an area not affected by any waste disposal activities). The top one foot of soil (Rocky Flats Alluvium) west of the West Spray Field as sampled. Table 4-3 presents the background soils data. A one-time sampling of a plot in the west buffer zone is not considered a complete characterization of background alluvial and bedrock materials; however, it serves as a basis for assessing potential contamination.

TABLE 4-3

METAL AND RADIONUCLIDE CONCENTRATIONS IN BACKGROUND SOIL

	Concentration (mg/kg)
Metals:	TIME / WET
Aluminum	6540-9140
Antimony	41 U
Arsenic	6.1 U - 10
Barium	135 U
Beryllium	3.4 U
Calcium	2500 U
Cadmium	3.4 U
Chromium (Total)	5.6 - 13
Cobalt	12 U - 25
Copper	12 U
Iron	9080 - 12,400
Lead	15 - 48
Magnesium	2500U
Manganese	196 - 337
Mercury	0.1 U
Nickel	20 U
Potassium	2500 U
Selenium	3.4 U
Silver	5 U
Sodium	2500 U
Thallium	6.8 U
Tin	41 U
Vanadium	30 U - 38
Zinc	20 - 49
	Concentration
	(pCi/gm)
Radionuclides:	
Pu	0.01(0.10) - 0.10(0.20)
Am	-0.02(0.03) - 0.28(0.16)
U233+234	0.66(0.16) - 1.4(0.20)
U238	0.62(0.16) - 1.2(0.2)
Tritium	-70(220) - 280(270)

Notes: 1) Background values based on nine composite samples collected from the top one foot of Rocky Flats Alluvium in the West Buffer Zone.

- 2) "U" indicates values less than detection limits
- 3) Values in parentheses indicate counting uncertainty
- 4) Tritium is in units of pCi/l of soil water

<u>Metals</u>

In general, metal concentrations in soil samples from the 881 Hillside Area were within the background levels shown in Table 4-3. Concentrations of metals exceeding the upper limit of the background range are shown in Table 4-4. These metal concentrations are generally within a factor of two of background.

One exception is calcium where numerous calcium concentrations exceeded three times background. This brought into question background values for calcium, because it is not a known component waste at the 881 Hillside Area. Lindsay (1979) presents calcium values ranging from 7,000 to 500,000 milligrams per kilogram (mg/kg) in soils with an average value of 13,700 mg/kg. All of the soil samples from the 881 Hillside had calcium concentrations within this general range.

Table 4-5 presents other metal concentrations in excess of three times background. With the exception of mercury, these metal concentrations are well within an order of magnitude of the upper background limit. Only in two samples collected from different boreholes was mercury in excess of one order of magnitude of the background concentration (2.07 mg/kg for sample BH06871020 and 1.63 mg/kg for sample BH128705BR). Because none of these metals are known to be components of waste disposed at the 881 Hillside Area and metal contamination of alluvial ground water is not prevalent, it is concluded that the metal concentrations are of little environmental significance and likely represent natural variations of metals in the soils.

TABLE 4-4

METAL CONCENTRATIONS IN SOILS ABOVE ESTINATED BACKGROUND LEVELS (mg/kg)

Sample No.	Al (9140)	As (10)	Ba (135u)	Ca (2500u)	cd (3.4u)	Cr (13)	co (25)	Cu (13u)	Fe (12,400)	Hg (0.1u))	Mg (2500)	Mn (337)	Ni (20u)	, (38)	Zu (46)
8H018701WT 8H018704WS 8H018710WS	11,100 13,500 9,660			3,160 4,650 4,200		4		. 4.		0.45	2,520				. , ,
8402870012 8402870012bup 8402871214 8402871420 84028714CT	9,720		162 155 	31,200 5,680 7,690 4,180		14.4 24.4		18.4 19.0 13.4 11.0	16,500 18,700 19,600 19,400 28,300		2,950 3,140 5,890	380	22.8	27.2 31.0 43.8	72.6 70.8 53.8 56.0
BH03870009 BH038702WT BH038709CT BH038709CTDup	17,200 21,200 17,200 13,400 10,800	44	140	8,580 13,600 66,700 31,300	7.44.	14 - 1	, , , , ,		18,300 22,800 13,400	0.12 0.23 0.23 0.19	4,220 6,330 3,600 3,220 3,000	. %	21 27	7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	53 62
BH04870610 BH048710WT BH048715CT BH048719BR BH048719BR	9,320 10,300 9,380 11,700	24 17 16 18 26		2,920 2,980 4,250 4,350				20	12,600 14,200 14,600 15,400	0.24	2,650	434			84 78
BH05870005 BH58705CT BH058708BR	12,700 12,100 11,600			5,040 10,600 5,250	ии. 4.6		E	• • •	16,500 13,900	0.17	3,220	528 557			51
BU06870010 BH06870010Dup BH06871020 BH068726CT BH068730BR	16,600	- 5 2 .	165	7,260 8,270 3,000 4,440	3.58	17 20		23	17,900 20,000 13,800 20,600	0.12 2.07 0.33	3,860 5,290 2,880		5	60	52 , 46 , 65 , 64 , 64 , 64 , 64 , 64 , 64
BH07870510 BH078705CT BH078708BR BH0787013 BH078710WS BH078710WS	13,800 9,280 13,100		• • • • • • • • • • • • • • • • • • •	4,920 4,600 4,830 3,990 5,000		. 2		4	14,800			372 420			988

Notes: 1) "-" Value below upper background value 2) Values in parentheses are the upper range of background values

TABLE 4-4 (Continued)

NETAL CONCENTRATIONS IN SOILS ABOVE ESTIMATED BACKGROUND LEVELS (mg/kg)

Sample No.	A1 (9140)	As (10)	Ba (135u)	Ca (2500u)	cd (3.4u)	CT.	(25)	Cu (13u)	Fe (12,400)	Hg (0.1u)	Mg (2500).	Mn (337)	N i (20u)	(38)	Zu (49)
BH08870007 BH088707CT BH088710BR	17,600 11,800 20,800	2	• • •	11,000	4.3	14.		🌣	14,100	0.27	2,680			67	108
BH09870010 BH098706WT BH098711CT BH098714BR	18,600	. 5	213	6,590 3,980 5,180 4,280		. 2		23.2 13.0	17,500		·		·	• • • •	8
BH0870010 BH0871020 BH108720CT BH08723BR	11,900	= 6	192	70,800 21,600 26,200 7,710		, 4 , ,		2	12,800 16,100 23,700	0.22 0.16 0.19	2,660 3,350 2,630	536	. 52 · 53		52 51 51
BH11870010 BH118711CT BH118714WT	9,900 15,000 9,750	, E .		5,790 2,770 6,920	6	, 2 ,	36		15,400 67,200	0.12	2,600	522	٦	5	
BH128702CT BH128705BR	17,400 9,230	4 .	258	3,880	•	4 ,		. 71	13,000 13,600	1.63	2,730		• •		
BH13870010 BH138711CT BH138714BR	13,400	2	811 231	56,400 104,000 4,540		15.6			33,600	0.18	3,680 5,000 533			41.6	. 60.2
BH148703W1 BH148706CT BH148708W2 BH148709BR	21,000 11,400 13,600		294	7,870 6,760 7,460 5,200	6.4	27.8 16.6 18.2		19.6 16.2 21.2 12.6	23,100 17,300 13,300 43,300		6,090 3,060 3,600		·	365.	63.2
BH15870005 BH15870005Dup BH15870510 BH158726BR	16,900 20,300 15,300	2	187	4,110 5,890 6,910 4,540	W.4	. 6 . 5		9	16,700 18,909 18,800	0.60 0.35 0.15 0.58	3,330			. 2	. 66 . 55 102
BH16870206 BH168702CT BH168706BR		. = .		12,700 3,020 5,320				₹. 5		0.14 0.14 0.32				50	
8H17870005 8H178705CT 8H178708BR	13,400 21,300 22,000	. 2 .		3,240 3,950 6,010	8.6.4	14 18 19			28,700 26,600	0.26 0.12 0.32	3,470			36	66
Notes: 1) H.	Led dullay Hall		Addd at	. Last barren	•										

Notes: 1) "-" Value below upper background value 2) Values in parentheses are the upper range of background values

TABLE 4-4 (Continued)

METAL CONCENTRATIONS IN SOILS ABOVE ESTIMATED BACKGROUND LEVELS (mg/kg)

Sample No.	Al (9140)	8 C (0)	Ba (135u)	Ca (2500u)	Cd (3.4u)	رد (13)	Co (25)	Cu (13u)	Fe (12,400)	Hg (0.1u)	Ng (2500)	Mn (337)	N i (20u)	(38)	2n (46)
											2				
BH578704DH	16,600	•	319	7,460	•	15.7	•		17,600		5,940			39.4	56.9
BH578710115	11			0,260	•	•	•		. , ,		•			• ;	
000 - 000 000 000 000 000 000 000 000 0	7 100			000	•				76,600	•	• (51.6	77.2
DES 7871/00	7,400			005,01				. ;		•	3,000			36	52.7
RH57871488	000,10		, 138	0,550				24.4	14,600	•	2,670		. :		67.9
R#57871854	00011			0,000	•		•	۷.8	•	•	3,350		28.8		138
BH5787200H	•			0,030				. 2		• '					66.7
BH578722DH	077.6		•	4.920				21.7	•		2,730		. ,		22.0
BH5787220HDup			•	5,690				22.9	15,500	•	000, 6				64.7
BH578724DH	10,800			5,830	9.9	14.8	33.1	25.4	57,700		3,690	459	63.5	2.07	135
B#5787260H	9,180			5,360		•		52.6	16,100	•	3,380	ì.		: ! .	87.1
BH2/8/5H8				2,280	•			23	12,600	•	2,890				93.4
BH588700UC	13,500		140	10,900	3.5			13.1	21.706		3 270		. •	8 17	1 78
BH588702CT	•		•	4,910						0.32					
BH588704BR	•			2,560				24.2			•				
BH598704UC	13,000	•	349	18.800										7 92	7
BH598704UCDup	13,300		494	14,600		13.4		15.1	•	•	2.720	354		7.07	200
BH598707CT	19,600		347	5,800	4.3	24.2		18.4	25,200	•	6,490	414	•	40.4	66.7
BH598709BR			524	4,500	•			•		•	• •				
BH618707DH	10,600	•		73,900							067.7				•
BH618709CT	•		202	29,800					16,400	0.57	3,760				
101010		•	•	006,12	•			•		91.0	3,430				
BH62870008	10,100	10.1	•	7,860	•			16.5	•	0.15	•		•		
BH628714BR			•	3,120	•			14.5	•	0.14	•	•	•	•	55.5
BH63870008	17,100	13.4	165	8,580		24.5		17.5	21,300	0.24	5,720		20.2	7,7	52.9
BH63870008D	9,370		•	6,300		. !		13.7	13,000	0.14	•		•		
BH638718UC				2.810		5.7				0.18					
BH638722CT				3,350						0.20				•	
B#638724BR		10.8	•	3,960	•		•	27.0	38,600	0.27	•	877	27.7	•	185

Notes: 1) "-" Value below upper background value 2) Values in parentheses are the upper range of background values

TABLE 4-5
METAL CONCENTRATIONS IN SOILS GREATER THAN THREE TIMES
BACKGROUND

36-4-1	O 1 - N -	Background	Sample
Metal	Sample No.	Concentration (mg/kg)	Concentration (mg/kg)
Barium	BH02871214	135U	440
	BH038709CTD	ip 135U	720
	BH138711CT	135U	811
	BH598704UCD	135Ú	464
Iron	BH118714WT	12,400	67,200
	BH148709BR	12,400	43,300
	BH578724DH	12,400	57,700
	BH638724BR	12,400	38,600
Mercury	BH018701WT	0.1U	0.45
	BH06871020	0.1U	2.07
	BH068730BR	0.1U	0.33
	BH128705BR	0.1U	1.63
	BH15870005	0.1U	0.60
	BH15870005Duj	p 0.1U	0.35
	BH158726BR	0.1U	0.58
	BH178708BR	$0.1 \mathrm{U}$	0.32
	BH588702CT	0.1U	0.32
	BH618709CT	0.1U	0.57
Nickel	BH118714WT	20U	71
	BH578724DH	20U	63.2
Zinc	BH118714WT	49	159
	BH638724BR	49	185

^{*} U indicates metal not detected at detection limit shown, e.g. 135 mg/kg is the reported detection limit for barium.

There are no background data for strontium in soils at the Rocky Flats Plant; however, inspection of all the data collected for this RI report and the 903 Pad, Mound, and East Trenches RI report show strontium concentrations to vary widely but randomly throughout the soils. Concentrations ranged from <20 mg/kg to 196 mg/kg but were generally less than 50 mg/kg at the Plant. Lindsay (1979) presented a range of 50 to 1,000 mg/kg and an average of 200 mg/kg for strontium in soils. Brown (1983) also presents a range of typical strontium values between 50 and 1,000 mg/kg, with an average of 200 mg/kg. Krauskopf (1979) presents an average strontium value for sand and sandstone of 20 mg/kg and an average strontium value for shales and recent clays of 400 mg/kg. Clearly, the strontium concentrations in the soil samples from the 881 Hillside Area (and entire Plant area) had strontium concentrations within these general ranges. Strontium is therefore not considered a contaminant at the 881 Hillside.

Radionuclides

Radionuclides are analyzed by counting particles randomly emitted during radioactive decay. The rate of decay approaches some average rate for the material as the counting period increases. Because actual samples are counted for finite periods of time, there will always be uncertainty associated with any measured value. Radionuclide concentrations are thus reported as a measured value plus or minus a two standard deviation counting uncertainty (error term). This uncertainty is indicated in parentheses immediately following the measured value.

A determination that two radionuclide concentrations are different from each other requires a statistical analysis incorporating the uncertainty. However, radionuclide concentrations with error terms larger than their respective measured value are not considered statistically different from the background values shown in Table 4-3 because of the significant overlap of the probability distributions. If the measured value for a radionuclide falls within the background measured value range, it is not considered to be above background levels, regardless of the error term. This is the basis for stating in this report that a radionuclide concentration is within background ranges. Similarly, if the measured value minus the error term for a sample is greater than the measured value plus the error term for the upper limit of the background range, it can be considered to be statistically different from background. This leaves a range of measured values and error terms between these extremes where, without a statistical analysis, it cannot be definitely stated whether the radionuclide concentration in the sample is different from background.

Uranium, plutonium, and americium concentrations in soil samples from the 881 Hillside Area generally met the above criteria for being within background levels. Background data are not available for strontium90 or cesium137. Table 4-6 shows those samples where radionuclide concentrations may be above background levels. Only two samples had uranium concentrations above estimated background levels, but even these concentrations were within a factor of two of the upper background concentrations. One sample (BH168702CT) had a plutonium concentration above background. The 903 Pad located north of this borehole is the probable source of this plutonium. Considering: 1) background concentrations for uranium are not well characterized; 2) most soil samples had uranium concentrations within the estimated background limits; and 3) only a few random samples had uranium concentrations that may be above the estimated background limits but are still within a factor of two, it is concluded that there is no likely uranium contamination of the soils at the 881 Hillside.

4.1.2 Organic Laboratory Contamination of Soil

The presence of Hazardous Substance List (HSL) organics in soil samples at concentrations above detection limits are indicative of contamination provided these organics are not present in laboratory blanks for the samples. However, the presence of an HSL organic in a laboratory blank and sample does not necessarily imply laboratory artifact if the concentration in the sample greatly exceeded the laboratory blank concentration. Many of the soil samples collected for this investigation were higher in concentration than the laboratory blank concentration and are discussed in appropriate SWMU subsections. There are also samples for which HSL organics are present at concentrations similar to those found in the blanks.

TABLE 4-6

RADIONUCLIDE CONCENTRATIONS IN SOILS AT THE 881 HILLSIDE
ABOVE BACKGROUND LEVELS

Sample No.	U ²³³⁺²³⁴	υ ²³⁸	Pu ²³⁹	Am ²⁴¹
Background Maximum	(1.4(0.2))	(1.2(0.2))	(0.1(0.20))	(0.28(0.16))
вн05870005	1.7(0.4)	1.9(0.5)		
BH068730BR	1.7(0.4)	1.4(0.5)		
BH088710BR		1.3(0.3)		-
BH168702CT			0.91(0.38)	•
BH17870005		-	0.38(0.14)	
BH178708BR	1.5(0.4)		•	
BH578714BR	1.6(0.2)	1.3(0.2)	-	•
BH578716DH	•	1.4(0.2)	•	
BH578724DH	2.2(0.2)**	1.8(0.2)**	•	•
BH578726DH	1.5(0.2)	1.5(0.2)	•	•
BH588702CT	-	1.3(0.2)	•	•
BH628714BR	•	1.3(0.2)	•	-
BH63870008	-	1.4(0.2)	•	•
BH638724BR	2.0(0.2)**	1.9(0.2)**		

- Notes: 1) Values in parentheses indicate counting errors.
 - 2) "**" Indicates values "likely" above estimated background (Measured value minus its counting error is greater than maximum background value plus its counting error).
 - 3) "-" Indicates value below maximum estimated background value or counting error is greater than its associated value.

Analytical data for most of the soil samples collected for this investigation indicate the presence of methylene chloride, acetone, and bis(2-ethylhexyl)phthalate, and occasionally 2-butanone, N-nitrosodiphenylamine, and di-n-butyl phthalate in laboratory blanks. The analytical data are shown in Tables 4-8 and 4-9 and summarized in Table 4-7. Inspection of the data indicates the following: methylene chloride generally was present at low or estimated (below detection limit) concentrations and often appeared in the blanks; acetone was almost always detected in the blanks, and its occurrence in samples was often at concentrations within a factor of 2 to 3 of that observed in the blanks; 2-butanone was generally present in samples only at estimated concentrations below detection limits and was present in one of the laboratory blanks; N-nitrosodiphenylamine, and di-n-butyl phthalate were generally present only at estimated concentrations below detection limits; and bis(2ethylhexyl)phthalate appeared in many of the samples, generally at estimated concentrations below detection limits or within a factor of 2 of the detection limit (330 ug/kg), and was present in several blanks. As mentioned, exceptions to these general conclusions are discussed subsequently under the SWMU subsections.

In general it appears that the presence of these compounds in the samples represent laboratory artifact. Methylene chloride, acetone, and 2-butanone are common volatile solvents used in the laboratory. N-nitrosodiphenylamine is a degradation product of the gas chromatograph column. Phthalates are components of plasticizers whose presence in a sample or blank can be generally attributed to contact with plastic. With the exception of acetone and bis(2-ethylhexyl)phthalate, the presence of these compounds in the soils is not expected based on the waste management history. Drums stored at SWMUs 119.1 and 119.2 (drum storage areas) or liquids dumped in unknown chemical dumping areas (SWMUs 102, 103, and 104)

TABLE 4-7
SUMMARY OF ORGANICS IN LAB BLANKS

Compound	Concentration Range in Laboratory <u>Blanks (ug/kg)</u>	Number of Occurrences <u>in Blanks</u>	Total Number <u>of Blanks</u>
Methylene Chloride	50U-25J	12	15
Acetone	50U-145	14	15
2-Butanone	50U-35J	3	15
N-nitrosodiphenylamine	330U-110J	2	15
di-n-Octylphthalate	330U	0	15
di-n-Butyl-phthalate	330U-51J	1	15
bis(2-ethylhexyl)phthalat	е 77Ј-434	5	15

Notes: 1) J - Indicates value is estimated below detection limit.

²⁾ U - Indicates compound was below detection limit.

likely contained acetone, vacuum pump oil, and hydraulic oils. Bis(2-ethylhexyl)phthalate is a component of vacuum pump oil (Sax and Lewis, 1987) and hydraulic oil (EPA, 1987).

4.2 OIL SLUDGE PIT AND CHEMICAL BURIAL SITES (SWMU REF No. 102 AND 103)

SWMUs 102 and 103 are grouped together for characterization purposes, as they were identified as being in the same location by DOE (1986b) and Rockwell International (1986b). Both references locate these sites south of Building 881 as shown on Figure 2-3. Two areas south of Building 881 were identified on aerial photographs as potentially being SWMUs 102 and 103. Their locations are herein revised to those shown on Plate 4-1 based on additional review of historical aerial photographs.

4.2.1 Oil Sludge Pit (SWMU Ref. No. 102)

A small area, possibly a pond, approximately 80 by 50 feet, which appears to contain liquids, can be observed approximately 500 feet south of Building 881 on 1955 photos. This location is in good agreement with that presented by Rockwell International (1986b) for SWMU 102. Seepage from this pond appears to extend south to Woman Creek in the photo. The oil sludge pit (SWMU 102) was reportedly used in 1958 based on interviews with Plant personnel (Rockwell International, 1986b). However, based on aerial photos, the oil sludge pit appears to have been in existence in 1955. No photos are available for 1958, and the oil sludge pit cannot be seen in photos taken in 1963.

A single occurrence of tetrachloroethene (PCE) was detected by the soil gas survey in the vicinity of SWMU 102. Molecular counts of 1541 of PCE were detected at soil gas point 106. No other volatile organics were detected in soil gas near SWMU 102.

Two boreholes were drilled in the vicinity of SWMU 102 to assess the presence and extent of soil contamination. BH5-87 was drilled at the location shown in Rockwell International (1986b) for SWMUs 102 and 103, and BH6-87 was drilled in the revised location of SWMU 102. BH6-87 was drilled as close to soil gas point 106 as site access allowed to investigate the occurrence of PCE in the soil gas.

The only volatile organics detected in either BH5-87 or BH6-87 were methylene chloride and acetone. These compounds were present at levels below those levels found in blanks in all samples from these two boreholes. PCE was not detected in either borehole. The semi-volatile bis(2-ethylhexyl)phthalate was detected in every sample of both boreholes at levels above those found in laboratory blanks (550 ppb).

In summary, SWMU 102 (Oil Sludge Pit) has been relocated south of its originally proposed location based on an aerial photography review. PCE was detected at one soil gas point in the revised location; however, PCE was not detected in soil samples at either location. Bis(2-ethylhexyl)phthalate was detected in soil samples from both locations.

4.2.2 Chemical Burial Site (SWMU Ref. No. 103)

A second liquid dumping site was identified approximately 150 feet southeast of Building 881 on 1963 aerial photographs. The site is herein identified as the

Chemical Dumping Site (SWMU 103) (Plate 4-1). This pit was roughly circular and measured approximately 50 feet in diameter.

Soil gas results indicate the presence of PCE in the vicinity of SWMU 103; no other volatile organics were detected in soil gas. PCE occurred at 434 molecular counts at soil gas point 97 south of SWMU 103 and at 272 counts at point 76 southeast of SWMU 103. A PCE molecular count of 68,576 (maximum in the immediate area) was found northwest of SWMU 103 at soil gas point 88.

Two boreholes were drilled near SWMU 103 to investigate these soil gas values. BH4-87 was drilled west of the site between soil gas points 88 and 97, and BH63-87 (completed as well 52-87) was drilled north of soil gas point 88 as close as site access allowed.

Methylene chloride, acetone, and TCE comprise the volatile organics detected in BH63-87. Methylene chloride and acetone occurred at levels within those detected in laboratory blanks, and TCE was detected in the blank for that batch. Thus, the volatile organics detected in borehole BH63-87 are considered to represent laboratory artifact and not soil contamination. PCE was not detected in soil samples from borehole BH63-87.

Volatile organics detected in BH4-87 include methylene chloride, acetone, 2-butanone, and 4-methyl-2-pentanone. Methylene chloride occurred within the range detected in laboratory blanks. Acetone and 2-butanone were also found in laboratory blanks for the batch; however, in soil samples from BH4-87 their concentrations exceeded those detected in the blanks. 4-methyl-2-pentanone was detected at 68 ppb in the 15 foot contact sample from BH4-87; however, little significance is given to the isolated occurrence of this compound.

Bis(2-ethylhexyl)phthalate was detected at levels exceeding those found in laboratory blanks in BH4-87, but it was not detected in BH63-87. This semi-volatile compound was found in the ten foot water table sample (BH048710WT) at 1600 ppb, the 15 foot contact sample (BH048715CT) at 960 ppb, and the 19 foot bedrock sample (BH048719BR) at 650 ppb. It was also estimated below the detection limit at 470 ppb in the 0 to 10 foot composite sample (BH04870610). Phenanthrene, fluoranthene, and pyrene were also estimated below detection limits in the 0 to 10 foot composite sample (BH04870610) at concentrations of 210 ppb, 290 ppb, and 240 ppb, respectively.

In conclusion, SWMU 103 has been relocated as shown on Plate 4-1 to approximately 150 feet southeast of Building 881 after reviewing historical aerial photographs. Soil gas results indicate the presence of PCE in the soil gas, although none was found in soil samples from boreholes BH4-87 or BH63-87. Acetone, 2-butanone, and bis(2-ethylhexyl)phthalate were found above levels found in laboratory blanks in soil samples from BH4-87, but no volatile or semi-volatile compounds were elevated in BH63-87.

4.3 NO. 6 FUEL OIL TANKS SITE (SWMUs 105.1 AND 105.2)

The two No. 6 fuel oil tanks located south of Building 881 are filled with concrete and should therefore not be a source of environmental contamination. Due to their location close to the building and the proximity of associated buried utilities, no boreholes could be drilled immediately adjacent to the tanks. Borehole BH62-87, located approximately 50 feet west of the tanks, is the nearest sampling location.

No contaminants were identified above background levels in samples from BH62-87. Methylene chloride and acetone were detected in all five samples from

BH62-87; however, the concentrations were well below those detected in laboratory blanks. No semi-volatile compounds were detected in samples from BH62-87. Therefore, the present data suggest that there is no environmental contamination associated with the two No. 6 fuel oil tanks.

4.4 OUTFALL SITE (SWMU 106)

The outfall site consists of an overflow line from the sanitary sewer sump in Building 887. This SWMU location (Plate 4-1) is based on previous investigations (Rockwell International, 1986b) and field identification of the pipe which daylights on the slope above BH2-87.

PCE was the only volatile organic detected in the soil gas downslope of the pipe's exit from the hillside. Borehole BH2-87 was drilled near the southern end of the outfall pipe to assess soil contamination below the discharge point.

Methylene chloride, acetone, and 2-butanone were the volatile organics detected in BH2-87. Methylene chloride and acetone were detected in all five samples from the borehole, and were most concentrated in the 14 to 20 foot composite (BH02871420) and the 14 foot contact sample (BH028714CT). Methylene chloride occurred at 200 ppb in the 14 to 20 foot composite and 49 ppb in the 14 foot contact sample, and acetone occurred at 100 ppb in the 14 to 20 foot composite and 82 ppb in the contact sample. 2-butanone was only detected in the 14 to 20 foot composite sample and the 14 foot contact sample at concentrations of 100 ppb and 75 ppb, respectively.

Semi-volatile compounds di-n-butyl-phthalate and bis(2-ethylhexyl)phthalate concentrations in BH2-87 exceeded the maximums found in laboratory blanks. Di-n-

butyl-phthalate occurred at 3643 ppb in the 0 to 12 foot composite (BH02870012), at 3133 ppb in the 12 to 14 foot composite (BH02871214), and at 3190 ppb in the 18 foot bedrock sample (BH028718BR). It was below detection limits in the 14 to 20 foot composite and the 14 foot bedrock sample. Bis(2-ethylhexyl)phthalate was elevated in all samples from the borehole. It ranged from 2800 ppb in the 14 to 20 foot composite sample to 7214 ppb in the 18 foot bedrock sample, with the highest concentrations occurring in the 0 to 12 foot composite (5023 ppb) and the 18 foot bedrock sample.

In summary, SWMU 106 is located as originally shown in Rockwell International (1986b). Contaminants in soils below the outfall are volatile organics methylene chloride, acetone, and 2-butanone and semi-volatiles di-n-butyl-phthalate and bis(2-ethylhexyl)phthalate. The volatile organics are most concentrated at the base of surficial materials near the contact with bedrock, while the semi-volatiles are most concentrated above and below this interface.

4.5 HILLSIDE OIL LEAK SITE (SWMU 107)

In May, 1973, an oil leak was discovered on the hillside south of Building 881 emerging from the building's footing drain outfall. The source of the oil was believed to be the two No. 6 fuel oil tanks (SWMU 105) south of the building; however, pressure testing of the tanks and associated lines did not reveal any leaks. The minimum detectable leak by the method used is unknown. A ditch and concrete skimming pond were built below the footing drain outfall to contain the oil. These structures are still present, although no oil has been observed in the outfall since 1973. The SWMU 107 location shown on Plate 4-1 includes the Building 881 footing drain and the skimming pond.

The soil gas survey around SWMU 107 indicates the presence of PCE, TCA, TCE, and DCE in soil gas. The highest concentrations of each of these compounds occurred at soil gas point 92 where PCE was 34,448 counts, TCA was 1,090 counts, TCE was 38,533 counts, and DCE was 2,854 counts. TCA and DCE were also detected due west of this point at soil gas point 95 with molecular counts of 721 and 609, respectively, but there were no other occurrences of these compounds in the area. The TCE value of 38,533 was an isolated occurrence. PCE on the other hand was detected at several soil gas points within and around SWMU 107 (Plate 4-3).

Several wells and boreholes were drilled in the vicinity of SWMU 107 to characterize soils, ground-water quality, and ground-water flow associated with the footing drain. Borehole BH62-87 (well 51-87) was installed within the area presumably drained by the footing drain, a six-inch vitrified clay pipe, and wells 53-87 and 54-87 were completed outside of this area to determine ground-water flow directions and quality around the drain. Borehole BH1-87 was also drilled and sampled outside the area of influence of the drain to examine soil contamination at soil gas point 92. BH3-87 (well 2-87) was drilled south of the skimming pond to evaluate soils and ground water downgradient of the pond.

As discussed in Section 4.4, no contaminants were identified above background levels in samples from BH62-87.

Several volatile organics and bis(2-ethylhexyl)phthalate were detected in BH1-87. Acetone was detected at concentrations above laboratory blank levels in all three samples from BH1-87. It occurred at 400 ppb in the 1 foot water table sample

(BH018701WT) and in the 4 foot sample (BH018704WS) and at 470 ppb in the 10 foot sample (BH018710WS). 2-butanone was also found above laboratory blank levels in all three samples at 120, 120, and 77 ppb, respectively. Trans-1,2-dichloroethene (t-1,2 DCE) and TCE were detected only in the 4 foot sample (BH018704WS). T-1,2 DCE was estimated below the detection limit (25 ppb) at 18 ppb, and TCE occurred at 120 ppb. PCE occurred at 190 ppb in the 4 foot sample and was estimated below the detection limit (DL) at 11 ppb in the 10 foot sample (BH018710WS). Bis(2-ethylhexyl)phthalate was detected at levels above laboratory blanks in the upper two samples from BH1-87 (BH018701WT; BH018704WS) at 880 and 1100 ppb, respectively.

No volatile organics were detected in BH3-87 above detection limits or laboratory contaminant levels. Methylene chloride was detected in all four samples analyzed for volatiles; however, concentrations were estimated below detection limits and were less than the levels of methylene chloride detected in laboratory blanks. Similarly, acetone and 2-butanone were either below detection limits or below levels detected in laboratory blanks.

Bis(2-ethylhexyl)phthalate was elevated above laboratory blank levels (maximum of 550 ppb) in the four samples from BH3-87 analyzed for semi-volatiles. It occurred at 940 ppb in the 0 to 9 foot composite (BH03870009), 700 ppb in the 2 foot water table sample (BH038702WT), 660 ppb in the 9 foot contact sample (BH038709CT), and 730 ppb in the 12 foot bedrock sample (BH038712BR). There were no other semi-volatile organics detected in soils at BH3-87.

In summary, the hillside oil leak site is actually the footing drain outfall from Building 881 and associated containment structures. No volatile organics were detected above laboratory contaminant or background levels, between the drain and

Building 881. Volatile organics (acetone, 2-butanone, t-1,2 DCE, TCE, and PCE) and bis(2-ethylhexyl)phthalate were detected in soils immediately south of the drain in BH1-87. These same compounds were detected in ground water in well 53-87. No volatile organics, were elevated in soils or ground water downgradient of the outfall skimming pond in BH3-87 (well 2-87), except for bis(2-ethylhexyl)phthalate was elevated in soils throughout BH3-87.

4.6 MULTIPLE SOLVENT SPILLS (SWMU 119)

Beginning in 1967, two areas east of Building 881 were used as barrel storage areas. The barrels contained unknown quantities and types of solvents and wastes. The two areas were expanded between 1967 and 1971, with major expansion occurring in 1969. Barrel storage in these areas was discontinued, and all barrels were removed by 1972.

4.6.1 <u>SWMU 119.1</u>

SWMU 119.1 is the westernmost of the two multiple solvent spill areas (Plate 4-1). The eastern portion of SWMU 119.1 was used beginning in 1967 for barrel storage (referred to herein as the original storage area), and the area was expanded to the west in 1969. The western expansion area was later covered with fill from the Building 776 1969 fire (SWMU 130).

The soil gas results in and around SWMU 119.1 revealed PCE and TCE in soil gas with an isolated occurrence of TCA. DCE and carbon tetrachloride (CCL4) were not detected in soil gas. PCE was the most widespread volatile organic in soil gas. Concentrations ranged from 0 to 169,155 molecular counts, with the greatest

concentration occurring near the center of the original storage area near borehole BH12-87 (soil gas point 39). TCE occurrences were more isolated and also concentrated near the center of the original storage area. TCE concentrations ranged from 0 to 138,549 (soil gas point 37) molecular counts. An isolated occurrence of TCA was detected at soil gas point 46.

Six boreholes were drilled in and around SWMU 119.1 to characterize soil contamination in the area. BH12-87, BH14-87, and BH57-87 were drilled and sampled near the center of the original storage area to investigate apparent soil gas plumes of PCE and TCE in the source area. Boreholes BH8-87, BH9-87, and BH13-87 were drilled on the periphery of SWMU 119.1 to assess the extent of soil contamination.

Volatile organic compounds acetone, 2-butanone, PCE, TCE, 1,1,1 TCA, 1,1,2 TCA, and toluene were detected in soil samples near the center of the original storage areas. Two samples were collected from BH12-87. One sample was taken from the colluvium/bedrock contact at 2 feet (BH128702CT), and the other was collected 3 feet below the contact from claystone bedrock (BH128705BR). Methylene chloride was detected in both samples at 130 ppb which is greater than concentrations in laboratory blanks. Acetone was also detected in both samples at 85 ppb and 66 ppb, respectively, but these values are within the range detected in laboratory blanks. 2-butanone was only at concentrations estimated below detection limits (37 ppb and 27 ppb, respectively). PCE was detected in the 2 foot contact sample only, and it was estimated below the detection limit at 19 ppb.

Methylene chloride, acetone, and TCE were detected in soil samples from BH14-87. Methylene chloride ranged from 27 ppb to 48 ppb in the four samples collected from this borehole. These concentrations are greater than those detected in

laboratory blanks for methylene chloride. Acetone was also detected in all four samples, but it occurred at the levels found in laboratory blanks. TCE was detected at 8 ppb in the 9 foot bedrock sample (BH148709BR) only.

Borehole BH57-87 was drilled immediately adjacent to well 9-74. Ground water at well 9-74 has historically contained high concentrations of volatile organics; however, its completion interval is unknown. Thus, BH57-87 was drilled, and well 43-87 was installed in the borehole to examine soil and ground-water contamination at this location.

Several volatile organics were detected above laboratory blank levels in BH57-87 which were not identified in BH12-87 or BH14-87. Methylene chloride was detected in all 11 samples from BH57-87 at concentrations ranging from 10 ppb to 36 ppb (all estimated below the detection limit of 50 ppb). Acetone was also detected in all samples from BH57-87 at concentrations ranging from 53 ppb in the 24 foot bedrock sample (BH578724DH) to 260 ppb in the 14 foot bedrock sample (BH578714BR). 2-butanone was detected at 100 ppb in the 14 foot bedrock sample and at 62 ppb in the 20 foot bedrock sample (BH578720DH), and 1,1,1 TCA ranged from 28 ppb to 110 ppb for the 4, 12, 14, and 18 foot samples (bedrock contact at 12 feet). TCE was above detection limits in the 8 foot sample (BH578708DH; 33 ppb), the 10 foot sample (BH578710UC; 81 ppb), the 12 foot contact sample (BH578712CT; 150 ppb), and the 14 foot bedrock sample (BH578714BR; 28 ppb). 1,1,2 TCA was above detection limits (25 ppb) in the 12 foot contact sample (BH578712CT) only, but PCE was above detection limits (25 ppb) in all samples taken from surficial materials. PCE was not detected in any of the bedrock samples (below 12 feet).

In summary, the volatile organics detected in BH57-87 are concentrated in surficial materials. PCE, 1,1,2 TCA, and TCE were detected only in surficial materials to a depth of 12 feet. However, acetone, 2-butanone, and 1,1,1 TCA were detected to a depth of 20 feet (8 feet into bedrock). Acetone and 2-butanone were detected above laboratory contaminant levels only in claystone bedrock to a depth of 20 feet. 1,1,1 TCA was detected in surficial materials and claystone bedrock to a depth of 18 feet.

Di-n-butyl-phthalate and bis(2-ethylhexyl)phthalate were the only semi-volatile compounds above detection limits and laboratory contaminant levels in boreholes BH12-87, BH14-87, and BH57-87. Bis(2-ethylhexyl)phthalate was within or near the range of laboratory contaminant levels in samples from BH12-87 and BH14-87. However, di-n-butyl-phthalate was elevated in all four samples from BH14-87. Concentrations of di-n-butyl-phthalate ranged from 1375 ppb in the 3 foot sample (BH148703W1) to 2702 ppb in the 9 foot bedrock sample (BH148709BR), with concentration increasing with depth. Bis(2-ethylhexyl)phthalate was elevated in BH57-87. It occurred above laboratory contaminant levels in the 16 foot bedrock sample (BH578716DH; 590 ppb), the 24 foot bedrock sample (BH578724DH; 830 ppb), and the 26 foot bedrock sample (BH578726DH; 1000 ppb). Di-n-butyl-phthalate was not detected in BH57-87.

Boreholes BH8-87, BH9-87, BH13-87 were drilled on the periphery of SWMU 119.1 to assess the extent of soil contamination. Methylene chloride, acetone, and 2-butanone were detected in all three samples from BH8-87. However, the concentrations were less than those in laboratory blanks and are attributed to laboratory contamination. Methylene chloride, acetone, and 2-butanone were elevated above laboratory contamination levels in two of the four samples from BH9-87. In

the 6 foot water table sample (BH098716WT), methylene chloride occurred at 63 ppb, acetone at 110 ppb (within laboratory contaminant levels but elevated with respect to other samples from the borehole, and 2-butanone occurred at 390 ppb. In the 14 foot bedrock sample (BH098714BR), methylene chloride was detected at 39 ppb, acetone at 280 ppb, and 2-butanone at 130 ppb. Methylene chloride and acetone were the only volatile organics detected in three samples from BH13-87, and they were above laboratory contaminant levels in the 14 foot bedrock sample only. Methylene chloride occurred at 46 ppb and acetone occurred at 280 ppb in this sample.

Bis(2-ethylhexyl)phthalate was elevated in all three SWMU 119.1 periphery boreholes. It occurred in BH8-87 at 3800 ppb in the 0 to 7 foot composite (BH08870007), at 3100 ppb in the 7 foot contact sample (BH088707CT), and at 3700 ppb in the 10 foot bedrock sample (BH088710BR). In BH9-87, bis(2-ethylhexyl)phthalate ranged from 1000 ppb to 3591 ppb and occurred in all four samples from the borehole. Di-n-butyl-phthalate was elevated (1493 ppb) in the 11 foot contact sample in BH9-87. Bis(2-ethylhexyl)phthalate was also elevated in the three samples from BH13-87 ranging from 1000 ppb to 3500 ppb and increasing in concentration with depth. Di-n-butyl-phthalate was also elevated (2016 ppb) in the 11 foot contact sample (BH138711CT) from BH13-87.

In conclusion, SWMU 119.1 is characterized by the presence of PCE and TCE in the soil gas and PCE, 1,1,1 TCA, and TCE in surficial materials. Acetone, 2-butanone, 1,1,2 TCA, and bis(2-ethylhexyl)phthalate appear to have infiltrated into weathered claystone bedrock to a maximum depth of 20 feet in BH57-87, and acetone and 2-butanone appear to be present in weathered claystone bedrock on the periphery of the site in boreholes BH9-87 and BH13-87. Bis(2-ethylhexyl)phthalate is present

throughout soils on the periphery of the site along with isolated occurrences of di-nbutyl-phthalate.

4.6.2 <u>SWMU 119.2</u>

SWMU 119.2 is the easternmost of the two multiple solvent spill areas. This area was used beginning in 1967 for barrel storage and was expanded to the area shown on Plate 4-1 in 1969.

Soil gas results in the vicinity of SWMU 119.2 indicate the presence of PCE in the soil gas with TCA and DCE detected only at soil gas point 11. PCE concentrations in soil gas ranged from 114 to 464 molecular counts in the area surrounding SWMU 119.2. TCA was detected at a molecular count of 659 of soil gas point 11, and DCE was detected at 819 molecular counts at the same location.

Five boreholes were drilled in and around SWMU 119.2 to characterize soil contamination in the area. Boreholes BH16-87, BH17-87, BH58-87, and BH59-87 were drilled immediately adjacent to the site, and BH61-87 was drilled downslope to evaluate a PCE molecular count of 114 at soil gas point 183.

Methylene chloride and bis(2-ethylhexyl)phthalate were the only organics detected above laboratory contaminant levels in BH16-87. Methylene chloride concentrations ranged from 35 to 46 ppb, and bis(2-ethylhexyl)phthalate was detected at 800 ppb in the 2 to 6 foot composite sample (BH16870206) and the 2 foot contact sample (BH168702CT) and at 750 ppb in the 6 foot bedrock sample (BH168706BR).

In borehole BH17-87, acetone, 2-butanone, and bis(2-ethylhexyl)phthalate were elevated above laboratory contaminant levels. Volatile organics acetone and 2-

butanone were elevated only in the bedrock sample (BH178708BR) at 8 feet. Acetone was detected at 250 ppb, and 2-butanone was detected at 130 ppb. Bis(2-ethylhexyl)phthalate was elevated in all three samples from BH17-87. It occurred at 1200 ppb in the 0 to 5 foot composite (BH17870005), 1300 ppb in the 5 foot contact sample (BH178705CT), and 1500 ppb in the 8 foot bedrock sample (BH178708BR).

Acetone, methylene chloride, and bis(2-ethylhexyl)phthalate were within the levels detected in laboratory blanks in BH58-87, although 1,1,1-TCA and TCE were detected. 1,1,1-TCA occurred at 42 ppb in the 0 to 2 foot sample (BH588700UC) and was estimated below the detection limit (25 ppb) in the 2 foot contact sample (BH588702CT; 23 ppb) and the 4 foot bedrock sample (BH588704BR; 10 ppb). TCE was estimated below the detection limit (25 ppb) in the 0 to 2 foot sample (8 ppb) and the 4 foot bedrock sample (7 ppb). TCE was undetected in the 2 foot contact sample. In addition to 1,1,1-TCA and TCE, di-n-butyl-phthalate was detected above laboratory blank levels in the 4 foot bedrock sample (650 ppb).

The only organic detected above laboratory blank levels in BH59-87 was bis(2-ethylhexyl)phthalate. It was detected at 1300 ppb in the 4 foot sample (BH598704UC), at 1500 ppb in the 7 foot contact sample (BH598707CT), and at 680 ppb in the 9 foot bedrock sample (BH598709BR).

No volatile organics were above detection limits in BH61-87, although PCE was detected in the soil gas at this location. No semi-volatile organics were detected above laboratory contaminant levels in soil samples from BH61-87.

In general, soils at 119.2 are characterized by the presence of bis(2-ethylhexyl)phthalate (BH16-87, BH17-87, and BH59-87). However, bis(2-ethylhexyl)phthalate was within laboratory blank levels in BH58-87. 1,1,1-TCA and

PHYSICAL AND CHEMICAL CHARACTERISTICS OF MAZARBOUS CONSTITUENTS IDENTIFIED AT THE 861 MILLSIDE

	25.00.00	97 #23	TI II BILITO GETANI		OCTAMOL /MATER	VAPOR PRESSURE		BOILING POINT			•
TACARDUDS COMETITS RATE	Carry Carry	LE LE LE LE	CLIAL LATIVE	₹ *	PARTITION COEF.	820°C. 760 1088		C. 760 1088	CAS #	REFERENCE	MAIRIX
Trichlocoethers	1.65	12.24	Slightly soluble	1,100	194.98	57.9		. 87	9-10-6	EPA 1964	8
1 1 1 Color Consession		17 221	Sitabely soluble	4.4×103	158.49	0.8		74.1	71-55-6	EPA 1984	§ ,
1,1,2-Trichtoroethene	<u>₹</u>	133.41	Slightly soluble >200	>200	147.90	6		113.77	8.00	EPA 1984	3
	(mb.gr.)							;			•
Tetrachloroethere	7.62	165.83	Slightly soluble	K.	758.58	±		121	127-10-4	EPA 189	i
1. Dichtocochane	1.17	8	Almost insoluble	5.50	61.66	<u>\$</u>		57.28	おおた	EPA 1964	3
4 2-5 (4) (40004)	***	8	Wighty soluble	8.700	31.62	. 5		23.47	107-06-2	EPA 1984	3
1 1-Dichlorosthere	<u> </u>	0.79	Inaciuble	:	:	82.28		37.8	73-35-4	EPA 1984	
	<u>:</u>	:						101 Kpe			
t, 1,2-Dichloroethene	1.27	8.	Slightly soluble	9	30.20	200 8 14°C		47.5	0.65-075	EPA 1984	3
	ည် အ	4,						ì		į	ŧ
2-Butanone	08.0	7.7	Very soluble	100,000	-	71.2		76.6		EPA 1906	3
	(sp.gr.)			2,52 e	3 727	8		76.55	\$.23.8	EPA 1984	3
Carbon Tetrachloride	ž	153.62	signtly soluble	3 6		2					
Bis (2-ethylhexyl)-	(sp.gr.) 0.965	391.0	Almost insoluble	. 6.9 . 6.9	199 x 10 ⁵	2 x 10 -7		366.9	117-81-7	EPA 1984	•
Phthalate Methylene Chloride	1.33	8 .9	Highly soluble	3,52 8	19.9	300	ķ	39.38	75-09-2	EPA 1984	••
	(ap.gr.)	;			:	15.7		115.8	1-01-101	ī	•
4 - Hethyl - 2 - Pentarone	ē .				:			:	1336-36-3	1	•
Araclar-1234 (PCB) Acetone	r R	8.	Miscible		:	705 # 34.5°C		28.2	1-49-19	84-674	43
	8 15°C										













